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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte VENKAT K. RAGHAVENDRAN

Appeal 2009-005357
Application 10/696,869
Technology Center 1700

Before MICHAEL P. COLAIANNI, CATHERINE Q. TIMM, and BEVERLY A. FRANKLIN, *Administrative Patent Judges*.

TIMM, *Administrative Patent Judge*.

DECISION ON APPEAL[1]

I. STATEMENT OF CASE

Appellant appeals under 35 U.S.C. § 134 from the Examiner's decision to reject claims 1-14, 26, 29-32, 34, 35, 38-54. We have jurisdiction under 35 U.S.C. § 6(b).

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[1] The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, or for filing a request for rehearing, as recited in 37 C.F.R. § 41.52, begins to run from the "MAIL DATE" (paper delivery mode) or the "NOTIFICATION DATE" (electronic delivery mode) shown on the PTOL-90A cover letter attached to this decision.

We AFFIRM.

Appellant's invention relates to a fiber reinforced laminate material which, upon heating and compression molding or thermoforming, forms a composite having a Class-A surface that is resin rich (Spec. 3). The laminate includes at least three layers of material:

(1) a layer including thermoplastic resin;

(2) a layer including a polymerizable component comprised of chemically reactive components such as macrocyclic oligoesters; and

(3) a layer of reinforcing fibers (Spec. 3-4).

The Examiner maintains, and Appellant seeks review of, the following rejections:

The rejection of claims 1-14, 26, 29-32, 34, 35, and 38-54 under 35 U.S.C. § 103(a) as being unpatentable over Kim (US Patent 4,983,247) in view of Winckler et al (US Patent 6,369,157); and

The rejection of claims 43-54 under 35 U.S.C. § 103(a) as being unpatentable over Minnick et al (US Patent 5,175,198) in view of Winckler et al.

Appellant focuses his arguments on claims 1, 43, and 47. Therefore, we select those claims as representative for deciding the issues on appeal.

II. DISCUSSION

A. REJECTION OVER KIM AND WINCKLER

1. CLAIM 1

Claim 1 requires that the layer of polymerizable component include a polycarbonate as well as a macrocyclic oligoester. Claim 1 reads as follows:

> 1. A composition of a fiber reinforced laminate material for a compression molding or thermoforming process, said composition of the laminate material comprising:
>
> a) a layer comprised of a thermoplastic resin;
>
> b) a layer of a polymerizable component comprised of polycarbonate and macrocyclic oligoester having a melt temperature, wherein on a weight basis the polycarbonate is greater than 50% of a total weight of the polymerizable component layer; and
>
> c) a layer of reinforcing fibers that are permeable by the thermoplastic resin and the polymerizable component at the melt temperature of the polymerizable component, said thermoplastic resin, polymerizable component and reinforcing fibers layers fusing and reacting forming a composite having a surface that is substantially fiber free and has a polymerized macrocyclic oligoester thereon.

The Examiner acknowledges that Kim does not teach including a macrocyclic oligoester (macrocyclic polyester oligomer) in the laminate described in that reference, but concludes that it would have been obvious to one of ordinary skill in the art to include the claimed macrocyclic oligoester in both the resin rich layer 12 and fiber filled thermoplastic body 16 of Kim (*see* Fig. 1 of Kim) based on the teachings of Winckler (Ans. 3-5).

Appellant contends that, based on the teachings of Winckler, one of ordinary skill in the art would have completely replaced the thermoplastic of Kim with Winckler's macrocyclic polyester oligomer and catalyst blend, and would not have used both the thermoplastic resin layer and oligomer layer, nor have blended the oligomer with polycarbonate as required by claim 1 (Br. 7-8).

The issue is: Does the evidence as a whole support the Examiner's conclusion that it would have been obvious to one of ordinary skill in the art to incorporate the oligoester of Winckler into the resin rich layer 12 and body 16 of Kim?

Based upon the findings and analysis of the Examiner, we answer this question in the affirmative. We emphasize the following relevant facts:

1. Kim relates to providing a resin rich layer on a molded composite thermoplastic body to obtain a smooth fiber free surface on the composite article (Kim, col. 1, ll. 6-7; col. 2, ll. 35-39).
2. The molded composite thermoplastic body (16, Fig. 1) may be formed from a composite sheet (e.g., 223, Fig. 2; 520, Fig. 5) of XENOY (a blend of polycarbonate and polybutylene terephthalate) containing glass fibers (Kim, col. 7, ll. 64-68; col. 4, ll. 57-60).
3. The resin rich layer (12, Fig. 1) may be formed from LEXAN powder (polycarbonate) (222, Fig. 2) or XENOY film (polycarbonate blended with polybutylene terephthalate) (512, Fig. 5) (Kim, col. 5, ll. 13-16; col. 7, ll. 22-40; col. 8, ll. 5-11)
4. Winckler describes a one component ready-to-use blend of a macrocyclic polyester oligomer and a polymerization catalyst that may be used to form polyester polymer composites (Winckler, col. 58-60; col. 2, ll. 18-26).
5. Macrocyclic polyester oligomers (what Appellant calls macrocyclic oligoesters) are attractive as matrices for

engineering thermoplastic composites because they exhibit low melt viscosity, allowing them to impregnate a dense fibrous preform easily. Furthermore, certain macrocyclic polyester oligomers, such as those for forming poly(1,4-butylene terephthalate) (PBT), melt and polymerize at temperatures well below the melting point of the resulting polymer. Because, upon melting in the presence of appropriate catalyst, these oligoesters isothermally polymerize and crystallize, cooling the mold to solidify the article for demolding is not required thereby reducing processing time and energy consumption (Winckler, col. 1, ll. 32-45; col. 1, l. 64 to col. 2, l. 7; col. 12, ll. 46-50).

6. The macrocyclic polyester oligomer blend material may be used in many different types of molding processes including resin film infusion (infusing a dry fiber layer with the melt of a film containing the oligoester/catalyst blend), powder coating to create a prepreg or film, and compression molding (Winckler, col. 3, ll. 6-12; col. 14, ll. 55-65).
7. Under the heading "Compression Molding," Winckler suggests polymerizing a macrocyclic PBT oligomer using the resin film infusion process (Winckler, col. 21, ll. 54-56).
8. Winckler suggests including fillers, which are defined as material other than the oligomer or catalyst, in amounts of from 0.1 to 70 wt. % (Winckler, col. 4, ll. 28-46; col. 10, ll. 4-23).

Because the question of obviousness is approached from the viewpoint of the ordinary artisan, the analysis must take into account not only what the references expressly teach, but what they would collectively suggest to one of ordinary skill in the art. *In re Simon*, 461 F.2d 1387, 1390 (CCPA 1972). This requires consideration of the inferences and creative steps that a person of ordinary skill in the art would employ. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007). "If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability." *Id.* at 417.

As pointed out by the Examiner, Kim describes using blends of polycarbonate and PBT in the resin rich layer 12 as well as a glass fiber reinforced blend of polycarbonate and PBT in the body 16 (Ans. 3, *see also* FF 1-3). Winckler suggests forming thermoplastic fiber reinforced composites by polymerizing the precursor of PBT (oligoester) in the presences of catalyst (oligoester/catalyst blend) to form the PBT (FF 4, 6, and 7). It follows that it would have been obvious to one of ordinary skill in the art to use the PBT precursor blend of Winckler in place of the already polymerized PBT in Kim to obtain the properties of PBT in the product while obtaining the desirable features of the oligoester/catalyst blend described by Winckler (FF 5). The product upon molding would further have the smooth fiber free outer surface taught by Kim resulting from the resin rich layer 12 (FF 1).

When the prior art is examined collectively taking into account the skill of the ordinary artisan as evidenced by the references, there is ample suggestion to substitute the oligoester/catalyst blend of Winckler for the

PBT of Kim (FF 1-7). Even though Winckler does not suggest adding polycarbonate, Kim provides a suggestion for doing so. Moreover, the Examiner's conclusion is further supported by the fact that Winckler suggests adding fillers (FF 8), which is further evidence that adding components other than oligoester, catalyst and fibers was also contemplated by Winckler.

2. CLAIMS 43 AND 47

Claims 43 and 47 are directed to a laminate having five layers including a core layer of a polymerizable component sandwiched by reinforcing fiber layers which are in turn covered by overlayers comprised of thermoplastic resin. Claim 43 further requires the upper overlayer include a polymerization agent (e.g., initiator, accelerator, cross-linker, catalyst, drying agent) (Spec. 4). Claim 43 is illustrative:

> 43. A composition of a fiber reinforced laminate material for a compression molding or thermoforming process, said composition of the laminate material comprising:
>
> a) an upper overlayer comprised of a thermoplastic resin and a polymerization agent;
>
> b) a upper layer of reinforcing fibers;
>
> c) a core layer comprised of a polymerizable component comprised of chemically reactive components;
>
> d) a lower layer of reinforcing fibers;
>
> e) a lower overlayer comprised of a thermoplastic resin;
>
> wherein the layers of reinforcing fibers are permeable by the thermoplastic resin and the polymerizable component, when the laminate material is under heat and compression; and
>
> wherein upon attaining a melt temperature in a mold, the polymerizable component has a lower viscosity than the thermoplastic resin, and under compression the layers fuse

> forming a composite having a substantially fiber free surface rich in the polymerizable component, where the polymerizable component polymerizes during formation of the composite.

Claim 47 is of similar scope to claim 43, except that: (1) the upper overlayer need not contain a polymerization agent; and (2) the core layer must include a macrocyclic oligoester.

The Examiner finds that Winckler teaches the formation of multi-layered laminates as required by claims 43 and 47, and this teaching would have provided a suggestion for forming a laminate of the type contemplated by Applicant (Ans. 6). The Examiner concludes that it would have been obvious to modify the laminate of Kim by including plural reinforcing fiber layers and plural overlayers because this modification would have involved a mere duplication of parts (Ans. 6 and 10).

With respect to claim 43, Appellant contends that the combination of Kim and Winckler does not teach an upper layer having both a thermoplastic resin and catalyst (polymerization agent) (Br. 8). With respect to both claims 43 and 47, Appellant contends there is no teaching of a five-layer composite of the claimed structure, and the five-layer composite is not a mere duplication of parts (Br. 8; Reply Br. 4).

The issue is: Does the evidence support the Examiner's conclusion that it would have been obvious to duplicate known layers to arrive at the five-layer laminate of claims 43 and 47?

We answer this question in the affirmative.

We add the following finding of fact:

9. Winckler teaches compression molding four layers of carbon fabric with cyclic PBT blend material (oligoester/catalyst) spread over the surface (Winckler, Example 15 at col. 26, ll. 43-52).

"The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007). Likewise, merely duplicating known elements is likely to be obvious when the results are predictable. *See In re Harza*, 274 F.2d 669, 671 (CCPA 1960) ("It is well settled that the mere duplication of parts has no patentable significance unless a new and unexpected results is produced.").

As we explained above, the combination of Kim and Winckler would have suggested to one of ordinary skill a laminate having a polycarbonate and oligoester/catalyst blend in the resin rich outer layer to obtain a smooth fiber free outer surface. There is thus a suggestion to include polycarbonate thermoplastic and polymerization agent (catalyst) in the upper overlayer resin rich layer as required by claim 43.

As shown by Winckler, it was known in the art to incorporate multiple layers of dry fiber reinforcing material into a laminate with the oligoester/catalyst blend spread over the surface (FF 8). Kim suggests using a fiber layer already impregnated with PBT (wet). A number of different configurations are suggested by the references including combinations of the wet fiber layers and dry fiber layers. We agree with the Examiner that multiplying the known or suggested layers, for instance, to obtain more of the properties those layers were known to possess, e.g., to include more

layers of fiber material for added strength or adding a resin rich layer to the other outer surface so both outer surfaces are smooth and fiber free, would have been the type of duplication of parts within the ordinary skill of the art. Appellant does not provide any evidence that the particularly claimed configuration provides an unexpected result.

B. REJECTION OVER MINNICK AND WINCKLER

With respect to the rejection of claims 43-54 over Minnick and Winckler, the Examiner concludes that it would have been obvious to one of ordinary skill in the art to modify the teachings of Minnick by using a blend of polycarbonate and a macrocyclic polyester oligomer (oligoester) blended with catalyst as taught by Winckler, "motivated by the ability to reduce processing time and energy consumption during the molding process because said macrocyclic polyester oligomers have favorable crystallization rates." (Ans. 8.)

Appellant contends that the Examiner has not provided an adequate reason for one skilled in the art to substitute the PBT of Minnick with Winckler's oligoester/catalyst blend to arrive at a oligoester/catalyst/-polycarbonate blend as claimed (Br. 10). According to Appellant, the Examiner has offered no information about the polymerization rates of polycarbonate under the conditions taught by Minnick, nor has the Examiner shown that the polymerization of a blend of the polycarbonate and oligoester actually produces favorable crystallization rates or lower melt temperatures (Br. 10).

We add the following findings of fact:

10. Minnick describes composites formed from laying up two to four sheets of glass fiber cloth between sheets of flame-retardant polycarbonate film with a core layer of non-flame-retardant thermoplastic (Minnick, col. 2, ll. 61-64).
11. Minnick suggests adding small amounts of non-flame-retardant resins, such as PBT, to the flame-retardant matrix to provide other properties (Minnick, col. 5, ll. 30-37).
12. Larger amounts of non-flame-retardant resin, such as PBT, can be added to the polycarbonate-containing core matrix as long as they are capped with layers of the flame-retardant resins during lamination (Minnick, col. 5, ll. 37-42).

The combination of Minnick and Winckler reasonably suggests replacing the already polymerized PBT of Minnick with the PBT precursor blend (oligoester/catalyst blend) of Winckler in order to obtain the advantages discussed by Winckler (FF 5 and 10-12).

While we agree with Appellant that the Examiner has not provided any information with regard to the crystallization rate and melting temperature of polycarbonate, those values would have been known to one of ordinary skill in the art, and skill is presumed on the part of the ordinary artisan rather than lack thereof. *See In re Sovish,* 769 F.2d 738, 743 (Fed. Cir. 1985). Under the circumstances, the burden is on Appellant to show that the polycarbonate properties, which would have been known to one of ordinary skill in the art, would have lead the ordinary artisan to conclude that adding polycarbonate to the oligoester/catalyst blend would not result in the advantages relied upon by the Examiner as motivation for the

combination. Appellant has not provided the necessary objective evidence to support the argument.

III. CONCLUSION

On the record before us, we sustain the rejections maintained by the Examiner.

IV. DECISION

The decision of the Examiner is affirmed.

V. TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED

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